

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:
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**PCT**

## NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(PCT Rule 71.1)

Applicant's or agent's file reference 4535PTWO/AGMa	Date of mailing (day/month/year) 23.11.2005	
International application No. PCT/EP2004/052380	International filing date (day/month/year) 30.09.2004	Priority date (day/month/year) 30.09.2003
Applicant DANIELI & C. OFFICINE MECCANICHE S.P.A. et al.		

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/I/B/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 -epo nl Fax: +31 70 340 - 3016	Authorized Officer Van der Leeden, L Tel. +31 70 340-3059
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**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 4535PTWO/AG/la	<b>FOR FURTHER ACTION</b> See Form PCT/IPEA/416	
International application No. PCT/EP2004/052380	International filing date (day/month/year) 30.09.2004	Priority date (day/month/year) 30.09.2003
<p>International Patent Classification (IPC) or national classification and IPC F16C13/02, C23C2/00, F16C23/04, F16C33/10, F16C33/66, F16C33/58</p>		
<p>Applicant DANIELI &amp; C. OFFICINE MECCANICHE S.P.A. et al.</p>		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 1 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)), containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>		
Date of submission of the demand 25.07.2005	Date of completion of this report 23.11.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer  Béguin-Adriaenssens, Telephone No. +31 70 340-3056	



INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITYInternational application No.  
PCT/EP2004/052380

IAP20 Rec'd PCT/PTO 23 MAR 2006

## Box No. 1. Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
    - international search (under Rules 12.3 and 23.1(b))
    - publication of the international application (under Rule 12.4)
    - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the elements\* of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

## Description, Pages

1-8 as originally filed

## Claims, Numbers

1-4 received on 12.08.2005 with letter of 09.08.2005

## Drawings, Sheets

1/8-8/8 as originally filed

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (specify):
  - any table(s) related to sequence listing (specify):
4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (specify):
  - any table(s) related to sequence listing (specify):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2004/052380

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	1-4
	No: Claims	
Inventive step (IS)	Yes: Claims	1-4
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-4
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)

**Re Item V**

**Reasoned Statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such Statement.**

**1 Reference is made to the following documents**

- D1: US-A-5 549 393 (MORANDO JORGE A) 27 August 1996 (1996-08-27)
- D2: US-A-3 796 471 (HOLM W) 12 March 1974 (1974-03-12)
- D3: PATENT ABSTRACTS OF JAPAN vol. 1999, no. 03, 31 March 1999 (1999-03-31) -& JP 10 317119 A (SUZUKI TEKKOSHO:KK), 2 December 1998 (1998-12-02)
- D4: US-A-6 065 876 (YASHIRO TOSHINORI ET AL) 23 May 2000 (2000-05-23)
- D5: US-A-5 099 780 (NAPPIER ROBERT W ET AL) 31 March 1992 (1992-03-31)
- D6: US-A-5 072 689 (OOKOUCHI TAKAHIKO ET AL) 17 December 1991 (1991-12-17)
- D7: DE 42 07 034 A (EICH JOSEPH KG & PARTNER GMBH) 16 September 1993 (1993-09-16)
- D8: US 2003/111779 A1 (MORANDO JORGE A) 19 June 2003 (2003-06-19)

**2 NOVELTY OF INDEPENDENT CLAIM 1.**

2.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):

A support bearing for a roll (10), adapted to be immersed in a liquid metal bath, defining a first rotation axis (66), comprising

- a first bush (34) fitted coaxially on pins (14) at the end of a roll (10) and with substantially cylindrical outer surface,
- a second bush (54) fixed to a supporting element (30) of the roll (10) wherein the first bush (34) is held inside the second bush (54) rotatably around the axis (66),
- wherein the second bush (54) has an outer convex (56) surface defining a

toroidal surface wherein the first and second bush (34, 54) define, during operation, a reciprocal contact surface throughout their common length, the second bush (54) is positioned inside a retaining ring (42,44,48) of the supporting element (30), said retaining ring having a substantially cylindrical inner surface whereby the bearing is suitable to rotate, substantially without friction, around a second axis orthogonal to the first axis (66).

2.2 The subject-matter of claim 1 of the application differs from this known support bearing in that (references applying to the application document) :

the first bush (31) has at least one axial helical groove (39) on the outer surface, and the second bush (34) has one or more substantially axial longitudinal grooves (40,41) on the inner surface.

As no document from the cited prior art discloses such a support bearing, the subject-matter of claim 1 is therefore new (Article 33(2) PCT).

**3. INVENTIVE STEP OF INDEPENDENT CLAIM 1**

3.1 The problem to be solved by the present invention may be regarded as: improving lubrication by evacuating the dross formed in the melt introduced in the bearing by the turbulence of the liquid metal.

3.2 The solution to this problem proposed in claim 1 is: both sort of grooves, the helical groove (39) on the outer surface of the first bush and the longitudinal grooves (40,41) on the inner surface of the second bush, by facing each other contribute to a better lubrication of the bearing.

3.3 These features result from a step being non-obvious in view of the cited prior art.

From document D5, the space around the sleeve defines, during motion of the roll, a longitudinal confined space (76) provided between the sleeve (62) and the contacting internal faces (72,74) of the bushing (64).

This do not give any suggestion to the skilled person to modify a support bearing as

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(SEPARATE SHEET)**

International application No.

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described in document D1 to the manner specified in claim 1, i.e. by forming an axial groove (40) on the inner surface of the second bush (34) facing the inner bush (31).

The present application is considered as involving an inventive step (Article 33(3) PCT).

**4. DEPENDENT CLAIMS**

Claims 2-4 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

IAP20 Rec'd FOSTPTO 23 MAR 2006

## NEW CLAIMS

1. Support bearing for a roll (33), adapted to be immersed in a liquid metal bath, defining a first rotation axis (X), comprising a first bush (31) fitted coaxially on pins (32) at the end of a roll (33) and with substantially cylindrical outer surface, a second bush (34) fixed to a supporting element (37) of the roll (33) wherein the first bush (31) is held inside the second bush (34) rotatingly around the axis (X), wherein the second bush (34) has an outer convex surface defining a toroidal surface wherein the first and second bush (31, 34) define, during operation, a reciprocal contact surface (43) throughout their common length, the second bush (34) is positioned inside a retaining ring of the supporting element (37), said retaining ring having a cylindrical inner surface whereby the bearing is suitable to rotate, substantially without friction, around a second axis orthogonal to the first axis (X) characterised in that the first bush (31) has at least one axial helical groove (39) on the outer surface and the second bush (34) has one or more substantially axial longitudinal grooves (40, 41) on the inner surface.
2. Device according to claim 1, wherein a first (40) of said longitudinal grooves is positioned before the reciprocal contact surface (43) in order to create an accumulation of liquid metal, suitable for lubricating and cooling, and a second (41) of said longitudinal grooves is positioned after said reciprocal contact surface (43).
3. Device according to claim 1, wherein the second bush (34) is kept in place by plates (35) welded to a bearing support (36).
4. Device according to claim 1, wherein the clearance between the first bush (31) and the second bush (34) is preferably less than 1 mm.